IN THE CLAIMS

Please cancel claims 1-29, and add claims 30-56 as indicated herein.

30. (New) A method of controlling a welding process having a plurality of welding cycles, comprising:

advancing a consumable electrode towards a workpiece; and

dynamically regulating a rate of advancement and an instantaneous melt rate of said consumable electrode during each of said plurality of welding cycles in response to a predetermined event occurring during said welding process.

31. (New) The method of claim 30, further comprising coordinating said instantaneous melt rate with said rate of advancement of said consumable electrode.

32. (New) The method of claim 30, further comprising controlling a source of power that is supplied to said consumable electrode.

33. (New) The method of claim 32, wherein said source of power produces a current waveform.

34. (New) The method of claim 30, further comprising monitoring a feedback signal associated with said welding process.

35. (New) The method of claim 34, wherein said feedback signal employs a voltage.

36. (New) The method of claim 35, wherein said feedback signal employs a current.

37. (New) The method of claim 30, further comprising sampling conditions associated with said welding process for a purpose of obtaining information for identifying said predetermined event in real time.

38. (New) The method of claim 37, further comprising processing said information to obtain a first reference signal for regulating said rate of advancement of said consumable electrode.

39. (New) The method of claim 37, further comprising:

sampling conditions associated with said welding process to obtain information for identifying said predetermined event in real time, and

processing said information to obtain a second reference signal for controlling said melt rate of said consumable electrode.

40. (New) The method of claim 30, wherein said welding process uses a shielding gas.

41. (New) The method of claim 40, wherein said shielding gas includes carbon dioxide.

42. (New) The method of claim 30, wherein said welding system operates in a dip transfer mode wherein each welding cycle includes an arcing phase during which said consumable electrode is spaced from said workpiece and an arc is generated across said space, said arc being operative to form a molten droplet on an end of said consumable electrode, and a short circuit phase during which said consumable electrode is in contact with said workpiece, each welding cycle changing from said arcing phase to said short circuit phase on contact of said molten droplet with said workpiece, and changing from said short circuit phase to said arcing phase after rupturing of a bridge of molten material formed between said consumable electrode and said workpiece.

43. (New) The method of claim 42, further comprising:

conditioning said welding system to form a molten droplet on the electrode end during the arcing phase which has a diameter greater than the diameter of said consumable electrode, and causing said molten droplet to detach from said consumable electrode after said molten droplet has come into contact with said workpiece to thereby ensure a short circuit and arcing phase occurs in each welding cycle.

44. (New) An arc welding system comprising:

a power source, and

a control unit and means for advancing a consumable electrode towards a workpiece during a welding process, said consumable electrode being energized by said power source to cause said consumable electrode to supply molten material to said workpiece, wherein said means for advancing is controlled by said control unit to dynamically regulate a rate of advancement of said consumable electrode in response to a predetermined event occurring during said welding process.

45. (New) The welding system of claim 44, wherein said power source is controlled by said control unit in response to said predetermined event to control an instantaneous melt rate of said consumable electrode.

46. (New) The welding system of claim 45, wherein said control unit is adapted to coordinate said instantaneous melt rate with said rate of advancement for said consumable electrode.

47. (New) The welding system of claim 44, further comprising a means for obtaining a feedback signal associated with said welding process.

48. (New) The welding system of claim 47, wherein said feedback signal includes a voltage.

49. (New) The welding system of claim 48, wherein said feedback signal includes a current.

50. (New) The welding system of claim 44, wherein said control unit is adapted to sample conditions associated with said welding process to obtain information for identifying said predetermined event in real time.

51. (New) The welding system of claim 50, wherein said control unit is adapted to process said information to obtain a first reference signal for regulating said rate of advancement of said consumable electrode.

52. (New) The welding system of claim 50, wherein said control unit is adapted to process said information to obtain a second reference signal for controlling said melt rate of said consumable electrode.

53. (New) The welding system of claim 44, wherein said welding process uses a shield gas.

54. (New) The welding system of claim 53, wherein said shielding gas includes carbon dioxide.

55. (New) The welding system of claim 44, wherein said welding system operates in a dip transfer mode over a plurality of welding cycles, wherein a welding cycle includes an arcing phase during which said consumable electrode is spaced from said workpiece and an arc is generated across said space, said arc being operative to form a molten droplet on the end of said consumable electrode, and a short circuit phase during which said consumable electrode is in contact with said workpiece, each welding cycle changing from said arcing phase to said short circuit phase on contact of said molten droplet with said workpiece, and changing from said short circuit phase to said arcing phase after rupturing of a bridge of molten material formed between said consumable electrode and said workpiece.

56. (New) The welding system of claim 55, comprising:

means for conditioning said welding system to form said molten droplet on an end of said consumable electrode during said arcing phase which has a diameter greater than a diameter of said consumable electrode, and

means for causing said molten droplet to detach from said consumable electrode after said molten droplet has come into contact with said workpiece to thereby ensure a short circuit phase occurs in said welding cycle.